US LHC Accelerator Research Program
FY06 Task Sheet; rev 2

Task Name: Study of a Rotatable Metal Collimator for LHC **Date:** 1 November 2005

Responsible Person(s) (overall lead, lead at other labs)**:**
Thomas W. Markiewicz, SLAC (lead)
Nikolai Mokhov, FNAL

Budget (specified for each lab)**:**

SLAC	$700k
FNAL	$ 20k
Total	$720k

Statement of work for current FY (include description of year's "deliverable" and, if appropriate one or a few intermediate milestones)**:**

A draft of a conceptual design report (CDR) for a collimator consisting of two 13.6cm diameter by 95cm long copper cylinders which could rotate to a fresh position if damaged was available at the end of FY05. This was the major deliverable of the FY05 Task. Details and motivations for the FY06 statement of work can be found within the CDR and the file of associated figures. The URLs in the embedded hyperlinks are as follows:

- CDR: http://www-project.slac.stanford.edu/ilc/larp/RC1%20conceptual%20design%20report%20Rev1.pdf
- Figures: http://www-project.slac.stanford.edu/ilc/larp/RC1%20CDR%20figures.pdf

In FY06 the task team will:

- Bring the Conceptual Design Report to a state where it can be released in non-draft form.
- Have a technical review of the design by a small committee of external experts
- Continue to explore, refine and improve the estimates of collimation system efficiency, energy deposition and engineering performance.
- Construct a first mechanical prototype of the collimator. This prototype, labeled "RC1" will test the thermal and mechanical properties of the design. This work will be done in two phases:
    - A single jaw will be supported as specified in the CDR and an external electric line source of heat used to test the cooling system and the deflection of the jaw under heat load.
    - The full mechanical assembly of two jaws contained within a vacuum vessel whose dimensions are consistent with the CERN Phase I adjustment system will be made. Tests of mechanical precision and gap setting accuracy as a function of rotation angle will be made.

- Acquire the engineering details and hardware necessary to convert RC1 into a fully beam-testable prototype collimator (RC2) in FY07.

Milestones:

- Release of RC1 CDR
- Technical review of RC1
- Application of heat to one jaw
- Two moveable jaws in a vacuum vessel

Deliverables:

- Written performance report of RC1

Manpower Summary:

ME	SLAC	1.00	FTE
Postdoc	FNAL	0.25	FTE
Postdoc	SLAC	1.00	FTE
Physicist	SLAC	0.25	FTE
Designer	SLAC	0.25	FTE

Statement of expected follow-on work in subsequent years (include "ultimate" goal and time scale for this sub-program, as well as plans for specific work and rough budget need for next 2 years)**:**
The ultimate goal of this sub-program is a successful design for low impedance, high efficiency LHC secondary collimators. The design will be validated with a sufficient but small (1-3) number of prototypes and beam tests. The design specifications and the prototypes are the primary deliverables. The time scale is set by the desirability of testing the prototypes with LHC beam in 2008/09. Based on the design study, prototype performance and overall experience with the Phase I collimation system in actual LHC running conditions, CERN will decide whether or not to proceed with the rotating collimator design. If a decision is made to proceed, this sub-project will provide an engineering drawing package to CERN and will support the effort to commission the collimators once they are manufactured and installed by CERN.

FY 2004: Introduction to project
FY 2005: Phase II CDR and Set Up of collimator lab at SLAC
FY 2006: Construction and thermal-mechanical tests of RC1
FY 2007: Design, construction and mechanical tests of RC2
FY 2008: Transfer of RC2 to CERN and Beam Tests of RC2
FY 2009: Final drawing package for CERN
FY 2010: Await production & installation by CERN
FY 2011: Commissioning support

Glossary:
RC: Rotatable Collimator
RC0: Existing NLC prototype

RC1: Prototype with horizontal jaws, made of non-exotic UHV compatible materials
RC2: Beam-test capable prototype with exotic materials

Outyear budget estimates:

FY	Labor	M&S	Shop	Grand Total
2004		11000		11000
2005	170000	20000		190000
2006	410000	127000	183000	720000
2007	410000	182000	285000	877000
2008	520000	42000	81000	643000
2009	520000	53000	27000	600000
2010	200000	21000		221000
2011	300000	64000		364000
Grand Total	2530000	520000	576000	3536000